Category 1 :**Respiratory monitoring**
Category 2 :**Respiratory - airway management**

A118 - ***A pressure reconstruction method for spontaneous breathing effort monitoring.***

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Introduction:

Estimating respiratory mechanics of mechanically ventilated (MV) patients is unreliable when patients exhibit spontaneous breathing (SB) efforts on top of ventilator support. This reverse triggering effect [1] results in an M-wave shaped pressure wave. A model-based method to reconstruct the affected airway pressure curve is presented to enable estimation of the true underlying respiratory mechanics of these patients.

Methods:

Airway pressure and flow data from 72 breaths of a pneumonia patient were used for proof of concept. A pressure wave reconstruction method 'fills' parts of the missing area caused by SB efforts and reverse triggering by connecting the peak pressure and end inspiration slope (Figure 1). A time-varying elastance model [2] is then used to identify underlying respiratory elastance (AUCE_{drs}). The area of the unreconstructed M-wave has less pressure, resulting in a lower overall AUCE_{drs} without reconstruction. The missing area of the airway pressure or AUCE_{drs} is hypothesized to be a surrogate of patient-specific inspiratory to assess the strength of SB efforts. AUCE_{drs} and missing area A_2 are compared with/without reconstruction.

Results:

Median AUCE_{drs} and breath-specific effort using reconstruction were 24.99[IQR:22.90-25.98] cmH_2O/l and 3.64 [IQR:0.00-3.87] % versus AUCE_{drs} of 20.87[IQR:15.24-27.48] cmH_2O/l for unreconstructed M-wave data, indicating significant patient and breath specific SB effort, and the expected higher elastance ($p < 0.05$).

Conclusions:

A simple reconstruction method enables the real-time measurements respiratory system properties of a SB patient and measure the surrogate of the SB effort, that latter of which has clinical useful in deciding whether to extubate or re-sedate the patient.

References:

1. E. Akoumianaki et al. CHEST 143:927-938, 2013.
2. Y. S. Chiew et al. BioMedical Engineering OnLine 10: 111, 2011.

Image 1 :

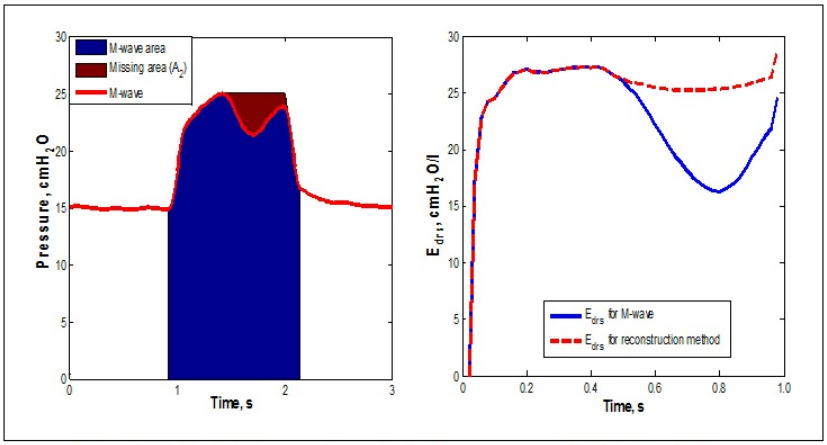

Figure 1. The E_{drs} for M-wave and reconstructed airway pressure at PEEP = 15 cmH_2O.